CLAIMS

What is claimed is:

1. A method for improving the yield of a syngas generation system, comprising providing a first gas stream containing a light hydrocarbon, mixing a second gas stream containing H_2S with the first gas stream to form a feed gas stream, mixing the feed gas stream with an oxygen containing stream to form a mixed feed stream, contacting the mixed feed stream with a hot catalyst to form a product stream, and removing syngas and elemental sulfur from the product stream.

2. The method according to claim 1 further comprising removing residual H_2S from the product stream.

3. The method according to claim 1 wherein mixing a second gas stream comprising H_2S with the first gas stream to form a feed gas stream is carried out at temperatures below 500 degrees C.

4. The method according to claim 1 wherein contacting the feed gas stream with a hot catalyst to form a product stream is carried out at temperatures above 500 degrees C.

5. The method according to claim 1 wherein less than 10% of the light hydrocarbon is converted to carbon dioxide.

6. The method according to claim 1 wherein the catalyst contact time is less than .01 seconds.

7. The method according to claim 1 wherein the catalyst is selected from the group consisting of: platinum, rhodium, iridium, nickel, palladium, iron, cobalt rhenium rubidium, Pd-La_2O_3, Pt/ZrO_2, Pt/Al_2O_3 and combinations thereof.

8. A system for the partial oxidation of light hydrocarbons, comprising a hydrocarbon injection line, an H_2S injection line in communication with said hydrocarbon injection line, an oxygen injection line in communication with said hydrocarbon injection line, a reaction zone receiving gases from said hydrocarbon, H_2S and oxygen injection lines and including a catalyst suitable for catalyzing said hydrocarbon to form CO and H_2.

9. The system according to claim 8 comprising a mixing zone upstream of said reaction zone, said mixing zone receiving gases from said hydrocarbon and said H_2S lines, wherein the temperature of said mixing zone is less than 500 degrees C.

10. The system according to claim 9 comprising a thermal barrier between said mixing zone and said reaction zone.

11. The system according to claim 9 wherein said oxygen injection line communicates with said reaction zone.

12. The system according to claim 9 wherein said mixing zone receives oxygen from said oxygen injection line.

13. The system according to claim 8 wherein the temperature of said reaction zone is greater than 500 degrees C.

14. The system according to claim 8 comprising at least one cooling zone downstream of said reaction zone.

15. The system according to claim 14 comprising at least one tailgas processing unit downstream of said cooling zone.

16. The system according to claim 8 wherein said catalyst is supported on a wire gauze.

17. The method according to claim 8 wherein the catalyst is selected from the group consisting of: platinum, rhodium, iridium, nickel, palladium, iron, cobalt rhenium rubidium, Pd-La_2O_3, Pt/ZrO_2, Pt/Al_2O_3 and combinations thereof.

18. A method for improving the yield of a syngas generation system, comprising providing a first gas stream comprising a light hydrocarbon, mixing a second gas stream comprising H2S with the first gas stream to form a feed gas stream, while maintaining said feed gas stream below 500 degrees C, contacting the feed gas stream with a hot catalyst to form a

product stream wherein less than 10% of the light hydrocarbon is converted to carbon dioxide, and removing syngas and elemental sulfur from the product stream.

19. The method according to claim 18 comprising mixing oxygen with the light hydrocarbon prior to contacting the feed gas stream with a hot catalyst.

20. The method according to claim 18 comprising mixing oxygen with the light hydrocarbon during the contacting of the feed gas stream with a hot catalyst.